

Practice: p. 604 #16

- Full test of significance

$L_1 = \text{men}$

$L_2 = \text{women}$

$$H_0: \mu_d = 0$$

$$H_a: \mu_d > 0$$

$$\mu_d = \text{Womens} - \text{mens}$$

Conditions:

1) paired data

2) SRS

3)  $\text{pop } d \geq 10n_d$

4) normal pop of diff or  $n_d \geq 30$

Check:

1) times were from same year + race

2) stated representative

3) there are more than 290 marathons run

4) normal prob. plot is  $\approx$  linear therefore assumed normal pop.

Cond. met  $\rightarrow$  t distrib.  $\rightarrow$  paired t test

$$t = \frac{16.852 - 0}{1.898 / \sqrt{29}} = 47.812$$


$$P(t > 47.812 | df = 28) = 1.084 \times 10^{-28}$$

We reject  $H_0$  b/c pvalue of  $1.084 \times 10^{-28} < \alpha = 0.05$ .  
We have sufficient evid. that the true avg. diff. btw. womens & mens winning marathon times is greater than 0 minutes. Therefore we conclude womens times are slower than mens times on average.

Cond. met  $\rightarrow$  t distrib  $\rightarrow$  paired t Int.

$$16.852 \pm (1.701) \left( \frac{1.898}{\sqrt{29}} \right) =$$

$\uparrow$   
 $n = 29$   
 $C = 90\%$



$$(16.252, 17.451)$$

We are 90% confident that the true avg. diff. btw. womens & mens winning marathon times is btw.

16.252 mins and 17.451 mins.

HW: p. 612 #8, 23